

Arachnida of Ain Gudeirat (Sinai), with notes on family Titanoeidae in Egypt

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Abstract

The region of Ain Gudeirat lies in the eastern side of northern Sinai, Egypt. It is almost a small oasis irrigated by a natural spring in this arid desert. During two short fieldtrips, on April and June 2004, to the region of Ain Gudeirat, 85 specimens of four arachnid orders were collected. The collected material contained 1 scorpion species, 1 sun-spider species, 1 pseudoscorpion species, and 72 spiders of 12 families. The majority of spiders belong to two families, i.e. Lycosidae (43.05%) and Titanoeidae (29.17%). The situation of family Titanoeidae in Egypt is discussed. This preliminary study is the first arachnological study of the region of Ain Gudeirat, which is proposed to be a protected area.

Keywords: Arachnida, spiders, Titanoeidae, scorpions, sun-spiders, pseudoscorpions, Ain Gudeirat, Sinai, Egypt.

Introduction

Ain El Gudeirat is in Wadi El Gudeirat near El Qusaima Village in the northeastern part of Sinai, near Egypt's eastern international borders. It is a spring issuing from Karstic limestones like other Karst springs encountered in the Eastern and Western Deserts of Egypt and in Sinai too. The spring is on the axis of a small syncline gently plunging west to outcrops of Eocene Limestone that overlie the Paleocene shales. Wadi El Gudeirat incises the Limestone formation to the contact between the two formations. Ain El Gudeirat issues from the lowermost part of the highly fractured limestones at a daily rate of 1500 m³. The springwater flows in a small channel and is used to irrigate several hundred feddans (1 feddan = 1.04 acre) of olive trees and as a source of supply for the local villagers. Ain El Gudeirat's water has a total dissolved solids content of 1440 ppm. Chemical analysis indicates that the water of this spring is of sodium chloride type. Groundwater age dating studies indicate that the age of water from Ain El Gudeirat

is 14 000 years B.P., indicating that the recharge to this spring is late Pleistocene (Idris, 1996). Its water temperature is 23.3 °C (El Ramly, 1965).

The fresh water of Ain Gudeirat converted its region of desert to a small oasis rich of plants especially *Tamarix* trees in addition to different kinds of herbs. Bedouins and their domestic animals, especially goats and dogs, are daily visitors of the area. The flora and fauna of the region is not studied yet. The available information is mostly about the neighbouring region of El Qusaima.

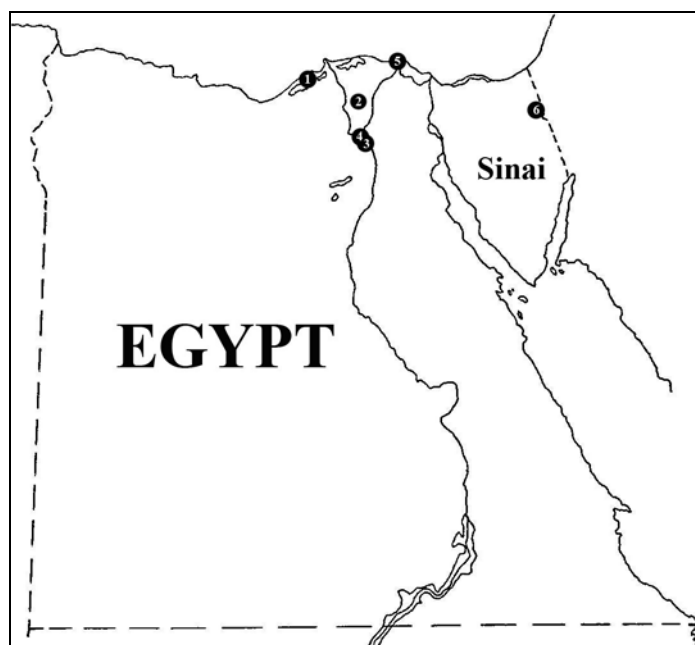
Among 21 species of five orders of mammals recorded from northern Sinai, six species were recorded from El Quseima and two species from Wadi and Ain Gudeirat, i.e. *Psammomys obesus terraesanctae* Thomas, 1902 and *Hystrix cristata* Linnaeus, 1758 of order Rodentia (Osborn & Helmy, 1980). Many bird species are present in the region, some are residents and others are migratory. Saleh (1997) recorded 8 lizard, 6 snake, and 1 toad (*Bufo viridis*) species from the region of El Quseima and its surroundings. Tadpoles were observed swimming in the water of the spring's channel on April 2004.

There are many insect species recorded from northern Sinai. Only, a few of them are recorded from Ain Gudeirat because of lack of a survey and continuous study of the region. Of course, many of these insects and other arthropods depend mainly on the spring's ecosystem.

There are plenty of dragonflies, order Odonata, flying near water surface. Several species of wasps, order Hymenoptera, and flies, order Diptera, were also observed in the region. The North African ant *Messor rufotestaceus* (Foerster, 1850) was recorded from El Quseima (Taylor & Sharaf, 2009).

Abdel-Dayem (2004) studied the diversity of carabid beetles in the Sinai peninsula and identified "Wadi Godirate" as one of the most seven specious sites in Sinai. He recorded 18 species of 10 genera from this moderately elevated site that is having a fresh water habitat. One of those species was thermophilous, found under stones, while the other species were hygrophilous, found at fresh water edges.

A few crabs, Crustacea, order Decapoda, were observed inside water channel and at its edges.



Map 1. Distribution of *Nurscia albomaculata* (Lucas, 1846) in Egypt. 1. Alexandria. 2. Shebin El-Kom. 3. Giza (Cairo). 4. Al-Kanater. 5. Ras El-Barr. 6. Ain Gudeirat.

Methods

The region of Ain Gudeirat (30°38'59.8"N, 34°26'13.7"E, Alt. 404 m) lies in the eastern side of northern Sinai, Egypt (Map 1). During two short fieldtrips, for a few hours, on 24 April and 3 June 2004, 85 specimens of four arachnid orders were collected, looking on plants and under stones, using light trap and UV radiation at night. [Abbreviations: TL = total length, L = length, W = width]. All measurements are in mm.

Results and Discussion

The collected material included 85 specimens of four orders: 1 scorpion, 10 sunspiders, 2 pseudoscorpions, and 72 spiders of 12 families.

I. Order Scorpionida

Only 1 scorpion of *Leiurus quinquestriatus* (Ehrenberg, 1828), Family Buthidae, was collected in June 2004, after sunset, using UV.

II. Order Solpugida

Ten males of *Biton ehrenbergi* Karsch, 1880 (Family Daesiidae) were collected; 1 under stone, and 6 attracted to light after sunset, in April + 3 attracted to light about 75 minutes after sunset, in June 2004.

III. Order Pseudoscorpionida

Two specimens, 1♂ and 1j, of *Minniza* sp., Family Olpiidae, were found under stones in June 2004.

IV. Order Araneida

The total of 72 spiders of 12 families were found on plants and under stones. The majority of spiders belong to two families, i.e. Lycosidae (43.05%) and Titanoecidae (29.17%) (Table 1).

Table 1. Spiders collected from Ain Gudeirat.

Family	24 April 2004	3 June 2004	%
Araneidae	1♀	---	1.388
Dictynidae	1♀	---	1.388
Filistatidae	---	1j	1.388
Gnaphosidae	---	1♂; 1♀	2.777
Linyphiidae	1♀, 1s♀	1♀	4.166
Lycosidae (6 species)	1♀ <i>Arctosa cinerea</i> ?; 1♀ <i>Hogna ferox</i> ; 4♂, 15♀, 2s♂, 2j	2♀, 1j <i>Arctosa cinerea</i> ?; 1♂ <i>Wadicosa</i> ?; 1s♂, 1j	43.05
Oecobiidae	1s♀ <i>Oecobius putus</i> ?	---	1.388
Pholcidae	1♀	---	1.388
Salticidae	1♀	1♂ <i>Menemerus animatus</i> ?	2.777
Sicariidae	1j <i>Loxosceles</i> sp.	3j <i>Loxosceles</i> sp.	5.555
Tetragnathidae	2j <i>Tetragnatha</i> sp. ?	1s♂, 1s♀ <i>Tetragnatha</i> sp. ?	5.555
Titanoecidae	3♂, 8♀, 2s♂, 1s♀, 1j <i>Nurscia albomaculata</i>	1♂, 4♀, 1j <i>Nurscia albomaculata</i>	29.17
Total	50 spiders	22 spiders	

El-Hennawy (2002a) recorded 7 families of spiders from 'Ain Jodairat (misspelling), depending on juvenile specimens collected in 1996 by Dr. Orabi; Filistatidae, Gnaphosidae, Lycosidae, Sicariidae (*Loxosceles* sp.), Theridiidae, Titanoecidae, and Zodariidae. Theridiidae and Zodariidae are wanting this time.

Nurscia albomaculata (Lucas, 1846), family Titanoecidae, was the most dominant species in the area after lycosid spiders. The flimsy webs of these cribellate spiders were found under stones and among low herbs near and over water. The pholcid spider was found in her web in a stone cavity. Other spiders were found under stones, in their webs, and moving on the ground or running on water surface. Seven lycosid females were carrying their egg sacs.

N. albomaculata was not recorded before from northern or southern Sinai (El-Hennawy, 2003, 2005). It was found in nature and inside green houses too. It lives inside its snare attached to plants stems on humid ground. It evidently prefers humid places. Therefore, it was not expected in desert. It is very interesting to find this species in the region of Ain Gudeirat's spring.

Beside the 26 protected areas in Egypt, the region of El Quseima and Ain Gudeirat is proposed as a future protected area. The decision makers usually look for big animals, for vertebrates and neglect other groups, especially "insects" (= including all arthropods). However, the region of Ain Gudeirat deserves study before protection.

Family Titanoecidae in Egypt

Family Titanoecidae Lehtinen 1967 is a small family of 44 species in 5 genera (Platnick, 2009). Its species are "widely distributed in Arctic as well as tropical regions (Indian Ocean Coast in Africa, not in Australia or New Zealand) but tend to be more common in the Northern Hemisphere" (Jocqué & Dippenaar-Schoeman, 2006).

Rock Weavers (Titanoecidae) are small to medium-sized araneomorph spiders. Their diagnostic characters are: three tarsal claws; cribellate; entelegyne; eight eyes; calamistrum long, uniseriate; endites parallel; male palpal tibia complex, with pro- and retrolateral apophyses (Jocqué & Dippenaar-Schoeman, 2006). The type genus of the family is *Titanoeca* Thorell, 1870.

Only two species of two genera of Family Titanoecidae Lehtinen, 1967 are recorded from Egypt until now (El-Hennawy, 2006). They are *Nurscia albomaculata* (Lucas, 1846) from Alexandria and Cairo (Giza) and *Titanoeca tristis* L. Koch, 1872 without known distribution in Egypt.

L. Koch (1875) described *Amaurobius tristis* as a new species from Anseba river's bank. Anseba River (Tigrinya) is now in Eritrea. This species was transferred to *Titanoeca* in Roewer's Katalog der Araneae (1954). Its distribution was "South Europe, Russia, and Egypt"! Possibly because of the title of the book?! El-Hennawy (1990, 2002b, 2006) recorded *T. tristis* from Egypt according to Roewer (1954). Wunderlich (1995) exclaimed when he discussed the distribution of *Titanoeca tristis* "Ägypten?". Indeed, *Amaurobius tristis* is recorded from Eritrea (not Ethiopia), but not Egypt (Platnick, 2009). Its systematic position may be doubtful. Lehtinen (1967: 271) stated that "*Amaurobius tristis* L. Koch 1875 (♀ type preservation unknown - from Ethiopia) was erroneously synonymized with *T. tristis* L. Koch 1872 by ROEWER (1954a). *A. tristis* L. Koch 1875 really seems to be a true *Titanoeca* but no new-name is here proposed, as its status remains obscure."

The second species is *Nurscia albomaculata* (Lucas, 1846). Genus *Nurscia* Simon, 1874 includes 4 species recorded from Portugal to France, Bulgaria, Cyprus to Central Asia, Russia, China, Korea, Taiwan, and Japan (Platnick, 2009). It was

transferred from the Amaurobiidae by Lehtinen (1967: 253). *N. albomaculata* is one of four species of genus *Nurscia* Simon, 1874. The world distribution of *N. albomaculata* is from Europe to Central Asia (Platnick, 2009).

A good summary of the diagnostic characters and figures of *N. albomaculata* is present in Nentwig, *et al.* (2003) and the most recent work dealt with it is that of Trotta (2005).

***Nurscia albomaculata* (Lucas, 1846)**

Synonyms (Platnick, 2009):

Epeira albo-maculata Lucas, 1846: 250, pl. 15, f. 6 (D♀).

Singa albo-maculata Simon, 1864: 256.

Amaurobius 12-maculatus Canestrini, 1868: 204 (D♂).

Amaurobius distinctus O. P.-Cambridge, 1872a: 263 (D♂♀).

Titanoeca albomaculata Simon, 1874a: 218, pl. 3, f. 7 (♂♀).

Titanoeca distincta O. P.-Cambridge, 1876: 557. *

Amaurobius albomaculatus Canestrini, 1876: 213.

Nurscia albomaculata Lehtinen, 1967: 253 (T♂♀ from *Titanoeca*).

* The record of O. P.-Cambridge of this species from Egypt (1876) was not included in Roewer's Katalog der Araneae (1954) or in "The World Spider Catalog" (Platnick, 2009).

O. P.-Cambridge (1876: 557) recorded *Titanoeca distincta*, of family Agelenides, from Egypt saying, "Adults and immature examples of this Spider were found among the dead stems and débris of bushes and under stones near Alexandria in April 1864. In the same month of the year following I met with it more abundantly under stones and fragments of rock and among débris on the plains of the Jordan". He made both *Amaurobius distinctus* Cambridge, 1872 and *Titanoeca albomaculata* Simon, 1874 synonyms to his *Titanoeca distincta*.

O. P.-Cambridge (1872: 263-264) described *Amaurobius distinctus* as follows:

Amaurobius distinctus, sp. nov.

Male adult, length $2\frac{3}{4}$ lines [= 5.82 mm]; female adult $3\frac{1}{4}$ [= 6.88 mm].

This remarkably distinct species, although closely allied to *A. simplex*, may be at once distinguished by two longitudinal rows of pure white spots on the upperside of the abdomen; the ground-colour of which is jet-black; these rows consist each of 5-6 spots, and they converge towards each other a little as they approach the spinners; the four foremost of the spots are the largest and occupy the fore half of the upperside of the abdomen, forming a large and nearly square area; the spots which succeed are smaller, and diminish gradually in size towards the spinners. The *cephalothorax* is of a dull yellow-brown colour, narrowly margined with black. The *eyes* are very similarly situated to those of *A. simplex*, but those of the lateral pairs are rather nearer to each other. The *legs* are moderately long and strong, and are furnished with hairs and a few spines, of which latter the chief consist of a row beneath the metatarsi of the first pair, short and tooth-like; the colour of the legs is a dull brownish yellow deepening at the extremities of the joints, and thus giving them a kind of indistinctly annulate look. The *falces* [chelicerae] are rather long, strong, similar to the cephalothorax in colour, slightly hollowed on their inner sides, and impressed near their extremities in front. The males of this species have a supernumerary spinning-organ but no calamistra; the females have both.

The *palpi* are short, strong, and similar in colour to the *legs*; the radial joint has some strong irregular prominences at its fore extremity; and the digital, which is large and of a

somewhat oblong-oval form, has a strong, rather angular, sharp-pointed prominence at its base on the outer side; the palpal organs are highly developed and prominent, having some large and variously formed corneous processes connected with them.

Several examples of both sexes, but the males immature, were found beneath stones and among débris of various kinds on the plains of the Jordan. In similar situations I also found examples of both sexes, both adult and immature, at Alexandria (Egypt) in 1864.

The description of O. P.-Cambridge (1872) is adequate for identification. Furthermore, eyes have almost the same diameter. Leg formula I-IV-II-III. The TL of males and females of *Nurscia albomaculata* from the region of Ain Gudeirat are: Males 5.30 - 6.30 mm (5.68 ± 0.54), Females 5.17 - 7.10 mm (6.29 ± 0.665). Body measurements of male (Fig. 1): TL 6.30, Cephalothorax L 2.91, Thoracic part W 2.01, Abdomen L 3.45, and female (Fig. 2): TL 7.10, Cephalothorax L 2.81, Thoracic part W 1.96, Abdomen L 4.35. Legs measurements of male and female (Table 2). Male's palpal organ (Figs. 3, 6) and female's cribellum (Fig. 4) and epigynum (Fig. 5).



Figs. 1-6. *Nurscia albomaculata* (Lucas, 1846). 1, 3, 6. Male. 2, 4, 5. Female. 1, 2. Habitus, dorsal view. 3, 6. Palp, prolateral and retrolateral views. 4. Abdomen, ventral view (Arrow → cribellum). 5. Epigynum, ventral view.

Table 2. Legs measurements of *Nurscia albomaculata* male and female.

Leg	Male				Female			
	I	II	III	IV	I	II	III	IV
Femur	2.65	2.23	1.85	2.65	2.38	2.01	1.54	1.80
Patella	1.48	0.79	0.53	0.90	1.01	0.90	0.79	0.85
Tibia	2.65	1.85	1.75	2.17	1.70	1.38	1.17	1.59
Metatarsus	2.39	1.85	1.59	1.96	1.70	1.32	1.22	1.59
Tarsus	1.01	0.95	0.79	0.85	0.85	0.69	0.69	0.69
Total length	10.18	7.67	6.51	8.53	7.64	6.30	5.41	6.52

Records and Distribution of *Nurscia albomaculata* in Egypt

Nurscia albomaculata was recorded from (Fig. 1):

1. Alexandria [31°12'51"N, 29°56'46"E]:
Amaurobius distinctus O.P.-Cambridge, 1872: 264.
Titanoeca distincta O.P.-Cambridge, 1876: 557.
Titanoeca albomaculata (= *Amaurobius distinctus*) Simon, 1880: 48.
Amaurobius (Titanoeca) albomaculata Simon, 1910: 276. Egypt.
2. Shebin El-Kom, Menoufiya Governorate (Ghabbour, *et al.*, 1999)¹. [30°33'17"N, 31°00'32"E]
3. Dokki, Giza (Cairo) (Sallam & El-Hennawy, 2003). [30°01'20"N, 31°12'18"E]
4. Al-Kanater Agricultural Research Station, El-Qalyubia governorate (Zaher *et al.*, 2005)². [30°11'39"N, 31°07'54"E]
5. Ras El-Barr, at the Mediterranean coast (New locality). [31°29'58"N, 31°48'30"E]
6. Ain Gudeirat, northern Sinai (New locality). [30°38'59.8"N, 34°26'13.7"E, Alt. 404 m]

¹ Among 2170 spiders belonging to 12 families collected by pitfall traps, only 1 ♂ *Titanoecidae* was found within Cucurbits (Cucurbitaceae) fields in Menoufiya Governorate (Ghabbour, *et al.*, 1999).

² During one-year survey on spiders inhabiting fields of nine vegetable crops of two families (Leguminosae and Cucurbitaceae) using pitfall traps at Al-Kanater Agricultural Research Station, El-Qalyubia governorate, *Nurscia* spiders were collected on April-June 2001 from the fields of summer cucumber and squash (Zaher *et al.*, 2005).

Natural history

The life style of *Titanoecidae* was summarized by Jocqué & Dippenaar-Schoeman (2006) as "Ground-dwelling spiders, making flimsy webs under stones or cribellate space webs". The same authors described the "natural history" of the family as follows: "*Titanoeca* spp. construct webs that occasionally include one or more pseudo-orbwebs (Shear, 1986). Members of the genus are usually found in dry rocky areas where they spin flimsy webs under stones and rocks. According to Szlep (1966), *Titanoeca albomaculata* Lucas is found during the day under stones, concealed in a silk retreat. In front of the retreat, a capture-web is attached to low vegetation and stones. The capture-web is compound, consisting of a number of partial webs surrounding the retreat entrance, and may be built in one or more planes and, depending on the substrate, one above the other. This type of web is intermediate between irregular webs and orbwebs. The shape of the web is variable and hackled bands may be present, reminiscent of webs of cribellate orb-weavers" (Dippenaar-Schoeman & Jocqué, 1997).

The web spinning of *Titanoeca albomaculata* was first studied by Szlep (1966). Shear (1986) discussed the "pseudo-orbs" of *Titanoeca albomaculata*, saying, "The web

of *Titanoeca albomaculata* is spun near the ground, and the spider has a retreat under a rock. No frame threads are spun, and radii are constructed in any particular order; some may be laid during the spinning of the cribellate thread. The cribellate thread appears nearly continuous and is laid across the whole range of radii, the spider turning back at the last radius in each series, and, according to Szlep (1966), the measuring activities of the spider resemble those of the orb-weaving uloborids. Additional elements, including sectors and semicircles, may be added later, so that there appear to be several "hubs" in the same web." Eberhard (2000) added "*Titanoeca albomaculata* makes webs resembling sections of orbs ... *Titanoeca*, non-orb weaving species that make geometrically highly organized and stereotyped webs that have semi-independent subunits (Szlep 1966)".

The life cycle of *Nurscia albomaculata* in laboratory was studied by Sallam & El-Hennawy (2003). It had 5-6 spiderling instars before adulthood for both males and females. It continued for about 109 days. Different instars were reared on different stages of larvae of cotton leaf worm *Spodoptera littoralis* (Boisduval, 1833). Adult females lived longer than males; nearly twice (about 144 against 70 days). Life span of females was also longer than that of males (about 244 against 182 days). Males died between October and March while females died between December and April. The studied individuals were found inside their silk tunnels among plants near the connections of the roots with the stems, immediately on soil surface, and under clusters of clay which cover the roots of the plants inside greenhouses of pepper (*Capsicum annum*) in Dokki, Giza. It was the dominant ground spider species in greenhouses. The authors noted cannibalism among adults and that *N.a.* may tolerate a wide range of temperature in nature.

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